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Sick of waiting: Does waiting for elective treatment cause sickness absence?

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ABSTRACT

Sickness absence represents a substantial cost in most of Western Europe, whether the insurance scheme is public or private. The objective of this study was to analyse whether waiting time for elective treatment in specialist health care is associated with the length of individual sickness absence in Norway. To estimate the association between waiting time and the duration of sick leave, we used data from the working population aged 18–67 years in 2010–2012. The files combined register data from The Norwegian Patient Registry with individual characteristics and sickness absence data from Statistics Norway, and was analysed using zero-truncated negative binomial regression. We found that about one in four employees who had one or more spells of sick leave in the period, was also waiting for consultation or treatment in specialist health care. Yet, the length of the waiting period had no substantial effect on the length of sickness absence (i.e., less than 0.1% reduction). Therefore, while measures to reduce waiting times for hospital treatment in many instances could be beneficial for the individual patient, such policies would probably not have any substantial impact on the national sickness absence rate.

1. Introduction

Sickness absence is a major societal problem both in terms of economic resources and public health [1], which makes it important to consider strategies that can reduce absence which could be avoided. Sickness absence due to waiting for specialist health care treatment is potentially one such type of avoidable absence.

Many patients in need of elective treatment find themselves on waiting lists of varying length. Treatment queues and waiting lists are used to organize resources efficiently and to prioritize among patient groups, although from a medical standpoint and from a patient-perspective, in many instances it will be undesirable to wait for treatment. Internationally, several policies to reduce waiting times have been implemented with varying degrees of success [2,3]. If sickness absence could be reduced by shortening waiting times, the gain from this could potentially outweigh the costs of reducing hospital waiting times.

There is little systematic knowledge on the relationship between waiting times and sick leave. The main objective of this study is to investigate the relationship between the waiting time for hospital treatment and long term sick leave in the population. Our hypothesis is that *shorter waiting time reduces long-term sick leave*. If a patient is sick-listed awaiting treatment, and the anticipated treatment is 100% effective (i.e., the patient is healthy and without side-effects after treatment), then the sick leave period would be shortened by the same number of days as a treatment was advanced. Hence, a delayed treatment also delays patient recovery and return to work (RTW).

However, there are several elements which modify this simple relationship. Medical conditions which lead to long-term absence, but do not require referral to specialist

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health care will also reduce the anticipated effect of waiting time on the duration of sickness absence. There are also many conditions with less severe symptoms that, although requiring hospital treatment, do not lead to sickness absence during the waiting period. Moreover, treatments have a varying degree of effectiveness. Some treatments may have side effects which lead to a longer rather than a shorter sick leave. Some conditions known to cause long-term absence are also hard to diagnose and treat (e.g., chronic fatigue syndrome, fibromyalgia and chronic non-specific musculoskeletal pain [4,5]). Finally, both the duration of the sick leave and the length of the period from referral to admission into specialist health care are most likely contingent of the severity of the patient's medical condition. In sum, there are a many situations where the effect of waiting time on the duration of sick leave is ambiguous. The effect should also vary across patient groups.

Decades of research has led to different types of explanations of variations in sickness absence, from changes in legislation and economic incentives [6–10], variations in general practitioners' (GPs') sick listing practice [11–13], economic cycles and enterprise downsizing [14–17], to individual characteristics such as work ethics and various types of social contagion [18–20]. The higher absence rate among women has also received significant attention [21,22].

Previous research on waiting times and sickness absence is limited, but findings mostly suggest a small, positive effect of waiting times on the duration of sick leave. Based on survey data with surgical patients at their first outpatient consultation, a Norwegian study from 1999 found that a majority of patients who were also sick-listed believed that the treatment they were waiting for would improve their ability to work. Their doctors, however, were somewhat less optimistic [23]. A more recent study from Norway evaluated a health policy reform targeted at reducing both waiting times and sickness absence [24]. The study found that the obtained reduction in waiting period for treatment or consultation in specialist health care also reduced the duration of sick leave, but to a lesser extent. The effect was stronger for surgical than non-surgical patients. An unpublished working paper on the duration of sick leave in Sweden found that waiting for health care increased sickness absence [25]. A weakness of the study, however, is that while sickness absence was obtained using register data, waiting times were estimated using survey data. Another Swedish study, which used municipality level panel data on health care expenditure and sickness absence and disability, found no substantial effect of expenditure on absence [26].

We assume that individual sick leave can be modelled as a function of time waiting for treatment, medical condition, individual traits such as age and gender, socioeconomic background, and their occupational sector and industry. This is expressed in Eq. (1), where y is the length of sick leave and W, M, I, S, O are vectors that describe the relationships with waiting time, medical condition, individual characteristics, socioeconomic status and occupational affiliation.

$$y = f(W, M, I, S, O) \quad (1)$$

Despite efforts to reduce sickness absence, long-term sickness absence in Norway continues to be higher than in the other OECD countries [27]. In Norway, sickness benefit is granted from the first day of absence (100% of the last wage). The first sixteen days are paid by the employer, while the subsequent period is covered by the social insurance office, and administered by the Norwegian Labour and Welfare Administration (NAV). Registration of short-term sick leave (usually up to eight days) can be done by the workers themselves, without a medical assessment, while sick leave beyond eight days requires medical assessment and registration.

To our knowledge, this is one of the first studies of the relationship between sick leave and waiting time for elective treatments, and the first to cover the entire population of a country. To test the possible association between waiting time and the duration of sick leave, we used register data from the working population in Norway in 2010–2012, including information on sick leave, hospital referral and admission dates, medical condition, and sociodemographic and -economic characteristics. Contrary to our expectations, we find no substantial effect of waiting times on long-term sickness absence. The implication of this is that reduced waiting time in specialist health care will probably not reduce sickness absence.

2. Materials and method

The study was based on data from two administrative registers, Statistics Norway (SSB) and the Norwegian Patient Registry (NPR). The data contained records for Norwegian residents aged 18–67 in 2010–2012 (3 461 498 persons). Approval was obtained by The Regional Committees for Medical and Health Research Ethics and the Norwegian Data Protection Authority (case no. 17/00368-2).

2.1. Outcome variable

The dependent variable is the duration of sick leave. Data on sick leave and duration of spells is administered by SSB in a national register of all employees aged 16–69, which contains start and end date of all sick leave registered by a doctor. The lack of information on self-registered sick leave does not pose a problem in our case, as short-term absence mostly represents health problems which do not require hospital treatment, which in most instances will pass without any medical assistance at all (e.g. colds, the flu, and other temporary conditions). This is why only sick leave issued by GPs is registered. The data contained in total 5 456 826 cases of sick leave from the population of 3 461 498 persons.

2.2. Explanatory variables

Data on length of time waiting for treatment, our main explanatory variable, stemmed from NPR together with hospital activity data. This included information activity and waiting times in somatic and psychiatric hospitals and specialized substance abuse treatment (PH/SSAT). Among the variables in the NPR data is a variable that records

the date of the first referral date to specialized treatment. This date variable, together with a variable that records the end date of the waiting time (when a medical assessment or treatment is initiated) allows us to calculate the number of days people wait for each treatment [*Waiting time* (*# of days*)]. The data also includes detailed medical information such as main and secondary diagnoses (WHO's International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10)), type of medical and surgical procedures (coded in the Norwegian classification system for surgical and medical treatment, NCSP and NCMP), type of contact (medical assessment, treatment, or control), and level of care (inpatient care, day treatment, or outpatient consultations). A separate record is generated in NPR each time a patient is in contact with the specialist health services either for assessment, treatment, or follow-up. For the three years under consideration here, this amounts to approximately 19 000 000 records, of which 14 665 240 were from somatic hospitals and 5 031 044 from PH/SSAT.

From the sick leave register we collected information on diagnosis tied to the sick leave. However, due to a large number of missing observations, this information could not be used. Hence, we were not able to cross-reference data on diagnosis from hospitals with diagnosis from the sick leave register to ascertain that their sick leave was related to the same condition(s) as the one(s) they were waiting for treatment for.

Data from SSB also contained information on gender, age, marital status, the number of people in the family, family type, education, income, occupational history (employment/unemployment records), sector and industry of the person's workplace(s). *Age* is set to the person's age in 2011. To control for a possible non-linear relationship between age and sick leave, a squared expression of the age variable [*Age squared*] was also included. Marital status was coded so that registered partners and married couples were given the same status (along with widow(er) and surviving partner), i.e., four categorical variables: *Unmarried/single*, *Married/registered partner*, *Widow(er)/surviving partner*, and *Divorced/separated*. *Income* was measured as average family income in NOK 50 000 (approximately EUR 4000). Occupational sector was coded into three categorical variables: *Government services*, *County- or municipal services* and *Private sector*. Finally information on industry affiliation (SN2007), based on the Norwegian adaptation of the Statistical classification of economic activities in the European Community (NACE Rev. 2), was used to generate a set of 21 control variables corresponding to the main categories of this classification scheme. Information of a persons' occupational history was used to exclude those who were either fully or partially unemployed during the period under consideration.

2.3. Data preparation and statistical approach

A unique, project specific identifier for each individual made it possible to combine the data from NPR and SSB into two different data files. While both contained information on sick leave and socioeconomic data from SSB, one included data on referral and treatment from somatic hospitals and the other from PH/SSAT. In both files, individual records from 2010 to 2012 were aggregated to one record per individual. This left us with a set of count variables, e.g. the number of days on waiting lists [*Waiting time* (*# of days*)], the number of waiting periods [*Waiting period* (*# of periods*)], the number of days on sick leave [*Sickness absence* (*# of days*)], and the number of hospital records with a particular diagnosis or treatment. This approach means that the data is cross-sectional, not cross-sectional time series, with the implication that this is not a causal analysis. The order of the events was accounted for using variables which recorded whether a person returned to work *before* being referred to hospital treatment, whether a person was sick-listed while waiting for treatment, whether a person was referred while being on a sick leave, or whether a person was sick-listed after the waiting period had finished and in-hospital treatment was initiated. Another set of variables recorded the average characteristics of individuals such as mean age, education, and income over the three years.

The final files consisted of 3 461 498 observations. In other words, there was one record per Norwegian resident between 18 and 67 years of age in each file (somatic hospitals and PH/SSAT). Individuals who were not employed in any of the three years were excluded, as they would not appear in the sick leave register. Due to concerns of data quality, individuals with waiting times longer than four years were also excluded. These exclusions resulted in 2 377 704 observations in the file with sick leave and waiting time in somatic hospitals and 2 382 463 observations in the file with sick leave and waiting time in PH/SSAT.

A zero-truncated negative binomial regression model was used to estimate the association between waiting time and number of days of sick leave. This is the most appropriate estimation technique for count data with no zeros and over dispersion [28]. We also tried a two-step negative binomial hurdle model, where the first stage models the probability of being sick-listed, and the second stage the duration of the sick leave, given that a person is sick-listed, but ran into convergence problems in some of the specifications. The zero-truncated model that we employed yields results equivalent to the second stage of the two-stage hurdle model.[1]

We modelled number of days on sick leave as a function of gender, age, education, family income, number of days on a waiting list, and the number of times a person was referred to specialist health care for a given medical condition (main chapter in ICD-10). To account for non-observed variance between those referred to specialist health care consultation or treatment and those who were not, we included a dummy variable which takes the value of 1 if a person was referred, 0 otherwise. We also included two variables which capture whether a person returned to work before being referred, and whether a person was sick-

[1] A simple logit regression model of the probability of being on sick leave as a function of waiting time and sociodemographic characteristics, which corresponds to the first step of a two-stage hurdle model, identifies a statistically significant ($p < 0.001$), but very weak, association between being on sick leave and waiting times (OR $\approx$ 1.000 for both somatic hospitals and PH/SSAT).

Table 1
Descriptive statistics for selected variables.

Variables	Mean		Standard deviation		Min/max
	Somatic	PH/SSAT	Somatic	PH/SSAT	
Sickness absence (# of days)	71.13	71.32	139.01	139.24	0/5235
Waiting time (# of days)	52.39	2.2	119.23	18.03	0/1449
Sickness absence (# of spells)	0.46	0,40	0.64	0.50	0/6
Waiting periods (# of periods)	0.93	0.06	1.51	0.33	0/51
	Mean		Standard deviation		
Age	40.46		13.20		17/68
Male	0.51		0.49		0/1
Education (0 = no education, 8 = PhD level)	4.45		1.66		0/8
Family income, NOK (median in parenthesis)	13 400 000 (800 253)		146 000 000		3 730 000 000
N	2 377 704 (Somatic), 2 382 463 (PH/SSAT)				

listed after hospital treatment. Table 1 provides descriptive statistics for the two files.

3. Results

About 26% of employees with one or more periods of sickness absence in 2010–2012 were also waiting for consultation or treatment in a somatic hospital, while only 3% were waiting for consultation or treatment in PH/SSAT. Initial analysis showed that absence was significantly higher among employees who were referred to specialist health care than among sick-listed employees who were not waiting for in-hospital consultation or treatment. Overall, the mean number of absent days among employees who experienced one or more spells of sick leave was 159 days. Among those who were sick-listed and waiting for treatment, the mean number of days on sick leave in the period was 171 days, compared to 143 days among employees who experience one or more spells of sick leave, but were not referred to somatic hospital treatment. Within PH/SSAT, the difference was even larger; 172 days versus 265 days.

Table 2 presents results from the empirical analysis — somatic and PH/SSAT hospitals, respectively. Starting with the explanatory variable of main interest, the number of days waiting for consultation or treatment in specialist health care, we found no substantial relationship. In somatic hospitals, one additional day waiting for hospital treatment corresponded to less than 0.1% increase in the number of days on sick leave. Given the mean waiting time of 159 days, this corresponds to 0.16 days, or only a couple of hours. In PH/SSAT, the association was also less than 0.1%. In other words, while statistically significant, the substantial effect was close to zero. Thus, we found no support for the hypothesis that shorter waiting time is associated with lower long-term sick leave. The result was robust to a number of different model specifications (see Section 3.1 below).

As explained above, we also included a dichotomous variable to control for whether a person was referred to specialist health care or not. We found a notable difference in the association of being referred either to a somatic hospital or to a PH/SSAT. In average, a person referred to consultation or treatment in somatic hospitals spent almost 10% fewer days on sick leave than those who were not. In contrast, people referred to PH/SSAT had almost 15% more days of sick leave than employees who were not referred to such treatment.

Table 2
Estimated number of days on sick leave in somatic and PH/SSAT hospitals, zero truncated negative binomial regression.

	Somatic hospitals	PH/SSAT
Waiting time (# days)	1.000	1.001
	(48.58)***	(8.89)***
Referred to specialist health care	0.893	1.144
	(35.63)***	(13.35)***
Male	0.830	0.805
	(86.94)***	(99.21)***
Age	1.058	1.055
	(93.26)***	(86.74)***
Age squared	0.999	1.000
	(79.74)***	(70.35)***
Education	0.953	0.948
	(75.58)***	(81.91)***
Family income (50' NOK)	1.000	1.000
	(5.16)***	(−0.88)
Not employed all three years	1.354	1.339
	(108.55)***	(102.62)***
Married/registered partner[a]	1.000	1.009
	(0.00)	(3.24)**
Widow(er)/surviving partner[a]	1.059	1.029
	(6.52)***	(3.21)**
Divorced/separated[a]	1.077	1.068
	(21.65)***	(18.92)***
Number of persons i family	0.990	0.998
	(11.79)***	(2.13)
Municipality sector[b]	1.043	1.040
	(17.51)***	(16.15)***
Public sector[b]	0.970	0.973
	(9.81)***	(8.62)***
RTW before waiting period	0.542	0.593
	(179.84)***	(47.87)***
Sick leave after waiting period	0.810	0.745
	(89.15)***	(32.50)***
N	935 090	938 256

IRR (incidence rate ratio), z-score in parenthesis.
[a] Unmarried/single individuals make up the reference category.
[b] Private sector is the reference category.
** $p < 0.01$.
*** $p < 0.001$.

Turning to the control variables, our results correspond well with previous research on sickness absence. Men had about 20% shorter absence than women. The duration of sick leave was also associated with higher age at a rate of about 5% per year. The squared term indicated that the association was weaker at the highest levels of age, at least within somatic hospitals (an incidence rate ratio for age

squared 0.999 means that for the oldest employees (68 years old), the positive correlation with age is reduced by (0.001×68^2=) 4.6%).

Also in line with previous research, on the importance of socioeconomic status, the duration of sickness absence was shorter among people with higher levels of education. Compared to people with no education, people with education at the PhD level had about 40% shorter sickness absence. In the file for somatic hospitals, the net effect of an education at the PhD level (coded with a value of 8) is 37.6% ($(0.953 - 1) \times 8$), while the difference in PH/SSAT is 41.6% ($(0.948 - 1) \times 8$). In comparison, the relation with income was smaller; less than 0.1% per NOK 50 000 increase. As expected, widow(er)s and divorcees had more sickness absence than others.

Compared to employees in the private sector, employees in the municipality or county services had about 4% longer spells of absence, while employees in the government services had about 3% shorter absence. The differences are relatively small, given the high levels of sickness absence in the municipality services. A possible explanation for this, supported by our material, is that much of the absence in the municipality service sector is a function of employee characteristics, such as gender and level of education.

3.1. Sensitivity analysis

To account for possible differences in the association between sickness absence and waiting time among different patient groups, we ran the models on different subgroups (e.g., defined by gender, age group, sector, industry, types of medical and surgical procedure, and main diagnosis). We also included a squared expression of income, as the association of income may be present only at the highest levels of income. In addition, we stratified the data by duration of sickness absence and length of waiting time, to see if the correlation was stronger among patients with e.g., medium-long spells of absence, or waiting periods of a certain length. We also included a squared expression of days on waiting list to test for a non-linear relationship. None of these exercises produced any substantially different results.

3.2. Study limitations

The aggregation from several to one record per individual, described above, implies a loss of information, as we did not follow individual trajectories from one day to another. Consequently, we cannot rule out the possibility that a more fine-grained analysis of the day-to-day trajectory could have identified stronger correlations for some subgroups of patients. However, the consistent lack of any substantial effect of the number of days waiting for assessment or treatment across model specifications and subgroups populations indicates that independently of aggregation level, overall sickness absence is probably not strongly related to time spent waiting for hospital treatment.

4. Discussion

We started out this paper with the expectation that waiting time in specialist health care was associated with sickness absence, so that lower waiting times could lead to reduced sickness absence. However, our findings provide little support for this. In the period 2010–2012, about one out of four employees experienced one or more spells of absence while at the same time waiting for consultation or treatment, mainly in somatic hospitals. We also found that sick-listed employees who were also on a waiting list had a significantly longer absence than those who were not referred to specialist health care. However, in the statistical analysis, where we also controlled for other factor known to influence the duration of sick leave, such as age, gender, and socioeconomic status, we found no substantial connection between waiting time and the duration of sick leave. On the other hand, we found that those referred to somatic hospitals on average had *shorter* spells of sick leave than those who were not, while sick-listed referred to PH/SSAT had *longer* spells of absence.

It is well documented that good health is unequally distributed in the population [29,30], and the social gradient in health is also present in sickness absence [31]. However, a large share of sickness absence is caused by medical conditions which do not necessarily have a quick fix, nor do they require treatment in specialist health care [24]. In Norway, about 60% of man-days lost to sickness absence are related to musculoskeletal disorders and mental health problems [32], none of which necessarily require specialist health care consultation or treatment.

Another factor which may influence the relationship between waiting time and sickness absence is the prioritization within the health care system, where more severe conditions and cases where treatment is more likely to be effective are given priority. Hence, more severe medical conditions can lead to prolonged sickness absence, but also shorter waiting time. The combination of these two factors — medical conditions which do not need specialist health care consultation but produce long-term sickness, and severe medical conditions which lead to both long-term sickness and expedient access to necessary specialist health care treatment, may explain why the length of sickness absence seems to be unrelated to the length of waiting time. Hence, policies to reduce waiting times could be beneficial from a patient perspective, but will probably not be effective in reducing national sickness absence.

5. Conclusion

To our knowledge, this is the first study which uses population register data to estimate the association between waiting times in specialist health care and sickness absence. While previous research is limited, the findings indicate that waiting times may prolong sickness absence [23,25]. Contrary to these studies, we find no systematic relationship between the two. One explanation for these divergent findings could be that previous studies were based on some degree of self-reporting, and the studies did not include the whole working population. While our study does not discard the possibility that shorter wait-

ing time could reduce sickness absence in some groups of sick-listed patients, or otherwise be beneficial, we find no evidence that the overall sickness absence would be significantly reduced if the time from referral to admission to hospital assessment or treatment was reduced. In other words, policies to reduce waiting time for elective treatment in Norway would probably not generate any substantial spillover effect for the national rate of sickness absence. To reduce the sickness absence rate, other interventions would have to be considered. Future studies should see if these findings are valid in other contexts as well.

Conflict of interest

The authors are not aware of any conflicts of interests related to this manuscript.

Disclaimer

Data from the Norwegian Patient Register has been used in this publication. The interpretation and reporting of these data are the sole responsibility of the authors, and no endorsement by the Norwegian Patient Register is intended nor should be inferred.

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